Claims

1. A laser vibrometer comprising a frequency modulated laser source for producing a transmit beam and a local oscillator signal, both having the same frequency modulation, means for directing the transmit beam to a scene and receiving radiation reflected from the scene and mixing means for mixing the received radiation with the local oscillator signal and a detector for detecting frequency variations between the received and local oscillator signals wherein the vibrometer further comprises an optical delay for delaying the local oscillator for substantially the flight time of the received radiation.

2. A laser vibrometer as claimed in claim 1 wherein the frequency modulation of] laser source comprises linear frequency ramps.

3. A laser vibrometer as claimed in claim 1 or claim 2 wherein the optical delay is a variable delay.

4. A laser vibrometer as claimed in claim 3 wherein the variable delay is a variable fibre optic delay line.

5. A laser vibrometer as claimed in any preceding claim wherein the delay applied by the delay means compensates for any bulk Doppler effects.

6. A laser vibrometer as claimed in any preceding claims wherein the delay is determined by a separate ranging/Doppler sensor.

7. A laser vibrometer as claimed in claim 6 wherein the ranging/Doppler sensor is integral with the vibrometer.

8. A laser vibrometer as claimed in any of claims 1 to 5 wherein the vibrometer is adapted to be operable in two modes, a first mode where bulk range and Doppler information is obtained and a second mode where the vibrometric image data is acquired, the data from the first mode being used to set the required delay for the second mode of operation.

9. A laser vibrometer as claimed in any preceding claim wherein the comprises a frequency stabilisation means.

10. A laser vibrometer as claimed in claim 9 wherein the frequency stabilisation means comprises means for identifying errors in the modulation and a modulator for correcting for said identified errors.

11. A laser vibrometer as claimed in claim 10 wherein the output of the source is split into two portions, one portion being fed into an optical delay and another portion being fed into the means for identifying errors.

12. A laser vibrometer as claimed in any preceding claim wherein the means for directing the transmit beam to a scene and receiving radiation reflected from the scene transmits and receives radiation from a plurality of look directions.

13. A laser vibrometer as claimed in any preceding claim wherein the laser source has a wide bandwidth frequency modulation.

14. A laser vibrometer as claimed in claim 13 wherein the frequency modulation has a bandwidth of at least 1 GHz.

15. A laser vibrometer as claimed in any preceding claim wherein the frequency modulation has a fast ramp time

16. A laser vibrometer as claimed in claim 15 wherein the ramp time is 10 μs of less.

17. A method of obtaining vibrometric data from a target comprising the steps of;

i) forming a transmit beam and a local oscillator signal from a frequency modulated continuous wave laser source,

ii) transmitting the transmit beam to a scene and receiving any radiation returned from the scene

iii) delaying the local oscillator for substantially the flight time of the received radiation, and

iv) mixing the received radiation with the delayed local oscillator signal and detecting the frequency of the mixed signal.

18. A method as claimed in claim 17 comprising the initial step of determining bulk range and Doppler information from the scene and using the range and Doppler information to set the delay on the local oscillator signal.

19. A method as claimed in claim 19 wherein the method comprises the step of processing the mixed signal to determine differential range and microDoppler information.